DESCRIPTION OF *CAREX KLAMATHENSIS* (CYPERACEAE), A RARE SEDGE OF THE KLAMATH REGION OF OREGON AND CALIFORNIA, U.S.A.

Barbara L. Wilson[1], Richard E. Brainerd[1], Lawrence P. Janeway[2], Keli Kuykendall[1], Danna Lytjen[1], Bruce Newhouse[1], Nick Otting[1], Stephen Meyers[3], and Peter F. Zika[4]

[1] *Carex Working Group, 2710 Emerald Street, Eugene, Oregon 97403, U.S.A.*
[2] *Biological Sciences Herbarium, California State University, Chico, California 95929, U.S.A.*
[3] *Department of Botany and Plant Pathology, 2082 Cordley Hall, Oregon State University, Corvallis, Oregon 97331, U.S.A.*
[4] *Herbarium, Box 355325, University of Washington, Seattle, Washington 98195, U.S.A.*
Contact author: Barbara L. Wilson, bwilson@peak.org

ABSTRACT

A previously undescribed sedge of serpentine fens in southwest Oregon and three California sites is described here as globally rare *Carex klamathensis*. This species is rhizomatous, with glaucous foliage and pale, more or less papillose, obovate perigynia with bent beaks. It resembles and may be most closely related to the midwest North American taxa *Carex meadii* and *Carex tetanica*. It differs from both of these in its achene surface morphology. In addition, it has smaller perigynia than *C. meadii* and wider staminate spikes than *C. tetanica*. It is most easily confused with a form of *C. hassei* that grows in serpentine fens in northwest California. That taxon usually has a mix of flowers with two or three stigmas in the same plant. *Carex klamathensis* consistently has flowers with three stigmas and is a taller, more robust plant with wider staminate spikes.

Key Words: *Carex klamathensis*, *Carex hassei*, serpentine endemic, Paniceae

RESUMEN

Se describe en este trabajo una ciperácea previamente no descrita de ciénegas serpentinícolas del suroeste de Oregón y de tres sitios en California como una endémica restringida, *Carex klamathensis*. La especie es rizomatosa con hojas glaucas y pálidas, más o menos papilosas, periginio obovado con picos doblados. Parece estar más estrechamente relacionada a los taxa del medio oeste de América del Norte, *Carex meadii* y *Carex tetanica*. Difiere de esas dos especies por la morfología de la superficie del aquenio. Además, posee un periginio más pequeño que *C. meadii* y espigas estaminadas más anchas que *C. tetanica*. Se puede confundir más fácilmente con una forma de *C. hassei* que ocurre en ciénegas serpentinícolas del noroeste de California. Ese taxón usualmente tiene una mezcla de flores con dos o tres estigmas en la misma planta. *Carex klamathensis* consistentemente tiene flores con tres estigmas y es una planta más alta, más robusta, con espigas estaminadas más anchas.

INTRODUCTION

A strongly glaucous sedge in *Carex* section *Paniceae* has long confused botanists studying serpentine fens in southwest Oregon. Its long rhizomes, three stigmas, and pale, papillose, perigynia initially led to its misidentification as *Carex californica* L.H. Bailey, a widespread but local plant of disturbed meadows and roadsides west of the Cascade Range. As botanists became more familiar with the serpentine species in the late 1980s, they realized that its indistinct perigynium beaks and pale shoot bases differentiated it from *C. californica,* which has tubular perigynium beaks and red-brown shoot bases, rhizomes, and scales. Then the species was identified as *Carex livida* (Wahlenb.) Willd., a species of northern bogs and known from a few Oregon sites and one California wetland (*Bolander 4745,* Mendocino County, California; specimen at UC). In the late 1990s Oregon botanists found that the serpentine plants differed from *C. livida* not only in habitat but also in inconspicuous but consistent morphological traits of the leaves, inflorescence, and perigynia.

At the same time Lawrence Janeway, working independently in California, discovered *Carex livida*-like sedges at three isolated springs on serpentine substrates (Fig. 1). This plant matched no other described species, although it resembled the Midwestern species *C. meadii* Dewey and *C. tetanica* Schkuhr (A.A. Reznicek, pers. comm.).

Further study revealed that the new species can be difficult to distinguish from a form of *C. hassei* L.H.

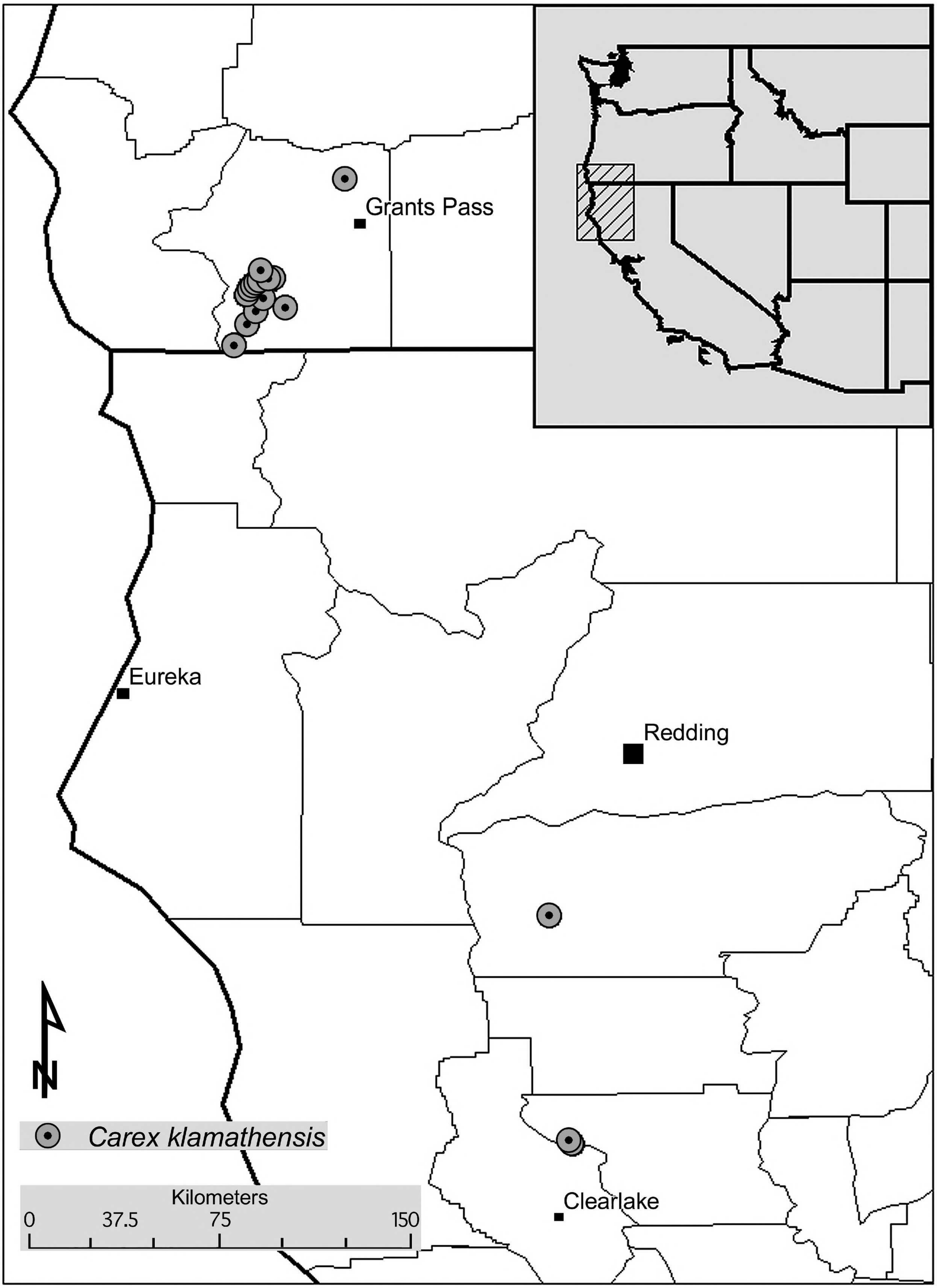

Fig. 1. Distribution of *Carex klamathensis* in southwest Oregon and northwest California. Inset map: western United States.

Bailey which lives in serpentine fens in northwest California and has a mix of 2-stigma and 3-stigma flowers in the same plant (Wilson et al. in preparation).

TAXONOMY

Carex klamathensis B.L. Wilson & L.P. Janeway, sp. nov. (**Figs. 2–3**). TYPE: U.S.A.: OREGON: Josephine Co.: BLM *Darlingtonia* fen along Eight Dollar Road, on S base of Eight Dollar Mountain, 0.9 mi from Route 199, full sun, peaty wet ground over serpentine, elev. 420m, 42°14' N, 123°40' W, 18 May 2004, *Peter F. Zika 19642* (HOLOTYPE: OSC; ISOTYPES: CHSC, MICH, MO, UC, WTU).

Carex klamathensis a *Carex livida* differt foliis latioribus, perigyniis obovatis brevioribus. Species haec *Carex meadii* affinis sed differt perigyniis brevioribus, acheniis paginis reticulatis minute. Species haec *Carex tetanica* affinis sed differt spicis terminalibus staminatis latioribus, acheniis paginis reticulatis minute. A *Carex hassei* differt perigynibus stigmatibus 3.

Description: Plant rhizomatous, the rhizomes whitish to medium brown, occasionally dull orange brown, paler than the dark to medium brown (rarely straw-colored) scales, slender, 1–2(–2.5) mm wide exclusive of sheathing scales. Shoot bases medium to dark brown, phyllopodic. Leaves glaucous with the sheaths basally white, with lower surface densely papillose between and sometimes over the veins, 18 to 50 cm long, the wider leaves 2–6 mm wide (average 3.8 mm). Ventral surface of leaf sheath hyaline, the mouth shallowly U-shaped. Culms 30–100 cm long, scabrous or not, longer than the leaves, erect at anthesis but sometimes bending over by the time the perigynia ripen. Inflorescence 5–23 cm long (average 14.5 cm), with 1–2(–4) lateral spikes. Bract of lowest spike 3–14 cm long (average 9.1 cm) including a sheath (0.8–)1.5–4(–8) mm long, 0.33 to 1.5 (average 0.67) times as long as the inflorescence. Lateral spikes pistillate, usually one per node, (0.6–)1.5–2.5 cm long, 4–7 mm wide, the uppermost usually 1.5–6 cm or more below the terminal spike, but sometimes as close as 0.3 cm below the terminal spike. Perigynia moderately crowded in the spike but the lowermost sometimes remote, the internodes in the middle of the spike 0.1–1.2 mm (average 0.5 mm) long. Terminal spikes all staminate in most populations, but in some populations, including those in California and on Sexton Mountain, Oregon, these may be gynecandrous or, less often pistillate, androgynous, or with staminate and pistillate flowers mixed. Staminate terminal spikes 1.3–2.7 cm (average 1.8 cm) long, 2–5 mm (average 3.6 mm) wide, 3.7–9.5 (average 5.3) times as long as wide, with 50–190 (average 112) flowers. Lowest staminate scale yellowish to reddish brown, paler near the midrib, acute to obtuse, often awned, 2.2–5.1 mm (average 2.3 mm) long excluding awn, the awn if present 0.3–3 mm (average 1.1 mm) long. Other staminate scales similar in color to the lowest, with the apex rounded and sometimes mucronate. Pistillate scales 3-nerved (the lateral nerves sometimes faint), reddish brown, dark brown, or rarely gold, the midrib and surrounding area green, white, or light brown, the edges sometimes pale, 1.9–2.8 mm long excluding awn, the apex rounded or obtuse, less often acute, sometimes mucronate to awned, the awn, if present, up to 1.5 mm long. Perigynia obovate to elliptic, 1.7–3.6 mm (average 2.9 mm) long, (0.8–)1.2–1.6(–1.8) mm (average 1.4 mm) wide, 1.6–2.4 (average 2.1) times as long as wide, light green, tan, or whitish, sometimes marked with dark brown distally, papillose particularly toward the beak or rarely smooth, the base succulent when fresh and drying withered, the beak usually curved, the distance from beak tip to top of achene (0.1–)0.4–0.7(–1) mm. Stigmas 3, or occasionally 2 on 0–5%(–15%) of flowers that have viable achenes. Achene greenish yellow when young, ripening dark brown, trigonous, or lenticular if stigmas 2, 1.6–2.7 mm (average 2.2 mm) long including stub at persistent base of deciduous style, 0.7–1.7 mm (average 1.2 mm) wide. Achene width/length ratio 0.67(0.44–0.88). Anthers 2.5–3.5 mm long when dry.

Habitat.—Fens on ultramafic (serpentine) soils, often with *Darlingtonia californica,* in Oregon at 400–950 m elevation in *Pinus jeffreyi* savannah; in California at 1000–1140 m elevation in chaparral.

Range.—Several populations in Josephine County, southwest Oregon, and also found at isolated sites in Colusa, Lake, and Tehama counties, California (Fig. 1).

KEY TO THE NORTH AMERICAN TAXA OF *CAREX* SECTIONS *BICOLORES* AND *PANICEAE*

The key for section *Paniceae* is modified from Rothrock and Reznicek (2002). Percents of pistillate flowers with various stigma numbers refer to perigynia that produce hard, dark, apparently viable achenes. In all *Carex,* aborted ovaries may have only two stigmas.

1. Stigmas prevailingly 2: 0–10%(–67% in *C. hassei*) of pistillate flowers with 3 stigmas _____ **Carex** section **Bicolores**
   2. Perigynia at maturity succulent throughout, orange to whitish, drying dark brown _____ **C. aurea**
   2. Perigynia at maturity dry throughout or succulent only at base, green, whitish, or tan.
      3. Pistillate scales black with green midrib _____ **C. bicolor**
      3. Pistillate scales gold to dark brown.
         4. Lateral spikes crowded, overlapping; terminal spike usually gynecandrous, perigynia usually crowded with internodes between them 0.2–0.7 mm; proximal staminate scales (2–)2.5–3.7 mm, awnless; scales rounded or obtuse; 90–100% of pistillate flowers with two stigmas each _____ **C. garberi**
         4. Lateral spikes often less crowded; terminal spike usually staminate; perigynia crowded or more distant with internodes between them 0.2–1.5 mm; proximal staminate scales 3–6(–15) mm, acute to awned; scales obtuse to acute, often awned; 33–100% of pistillate flowers with two stigmas each _____ **C. hassei**

1. Stigmas prevailingly 3; (80%–)90–100% of pistillate flowers with 3 stigmas _____ **Carex** section **Paniceae**
   5. Perigynium apex contracted to a cylindrical beak (0.4–)0.6–1.8(–2.2) mm long.
      6. Bladeless basal sheaths and proximal leaf sheaths pale brown; columns, leaves, and perigynia not or very sparsely papillose _____ **C. vaginata**
      6. Bladeless basal sheaths and proximal leaf sheaths strongly tinged with reddish purple; culms, leaves, and perigynia heavily papillose.
         7. Perigynia 4.2–6.8 mm long; beak 0.8–1.8(–2.2) mm long; range eastern _____ **C. polymorpha**
         7. Perigynia 3.4–4.2 mm long; beak 0.5–1 mm long; range western _____ **C. californica**
   5. Perigynium apex tapering and beakless, indistinctly beaked, or contracted to a beak less than 0.5 mm long.
      8. Lateral spikes nodding on flexible peduncles _____ **C. laxa**
      8. Lateral spikes erect or ascending on stiff peduncles.
         9. Perigynia beak straight, cuneately tapering; leaves channeled, glaucous _____ **C. livida**
         9. Perigynia beak curved, concavely tapering (at least on one side); leaves flat or folded, glaucous or not.
            10. Bladeless basal sheaths and proximal leaf sheaths strongly tinged with reddish purple plants forming loose clumps to extensive closed colonies of vegetative shoots from superficial rhizomes.
               11. Widest leaves 1.8–3(–4) mm wide; plants colonial with longest rhizomes 2.5–18 cm; habitat woodlands _____ **C. woodii**
               11. Widest leaves 3.5–6 mm wide; leaves loosely cespitose with longest rhizomes to 2 cm; habitat granite balds and cliffs _____ **C. biltmoreana**
            10. Bladeless basal sheaths and proximal leaf sheaths brownish or faintly, irregularly tinged with reddish purple; plants usually with vegetative shoots widely scattered and inconspicuous from deep rhizomes.
               12. Inflorescences usually 1.7–3.5(–4.3) times as long as bract (measured from node of proximal nonbasal spike).
                  13. Perigynia 0.6–1.4(–1.8) mm wide; achenes 0.7–1.7 mm wide; range Oregon and California _____ **C. klamathensis**
                  13. Perigynia 1.4–2.4 mm wide; achenes 1.8–2.9 mm wide; range Eurasia, introduced to northeastern North America _____ **C. panicea**
               12. Inflorescence usually 0.9–1.6 times as long as bract (measured from node of proximal nonbasal spike).
                  14. Achenes (1.5–)1.7–2.2(–2.5) mm wide _____ **C. meadii**
                  14. Achenes 0.7–1.7(–1.9) mm wide.
                     15. Achene surface reticulate with a papilla filling each compartment outlined by the ridges; terminal spike narrow (1.8–3 mm wide); range east of the Rocky Mountains _____ **C. tetanica**
                     15. Achene surface reticulate but flat between ridges (or with a tiny papilla in the center of each compartment); terminal spike wide, (2–5 mm wide); range in Oregon and California _____ **C. klamathensis**

DISCUSSION

Carex klamathensis is easily confused with other rhizomatous sedges that have glaucous foliage, pale brown or whitish (not red-brown) plant bases, and pale, more or less papillose perigynia. Compared to *C. livida*, *C. klamathensis* has wider leaves, more staminate flowers, and shorter, obovate (not fusiform) perigynia (Table 1; Fig. 3 and 4).

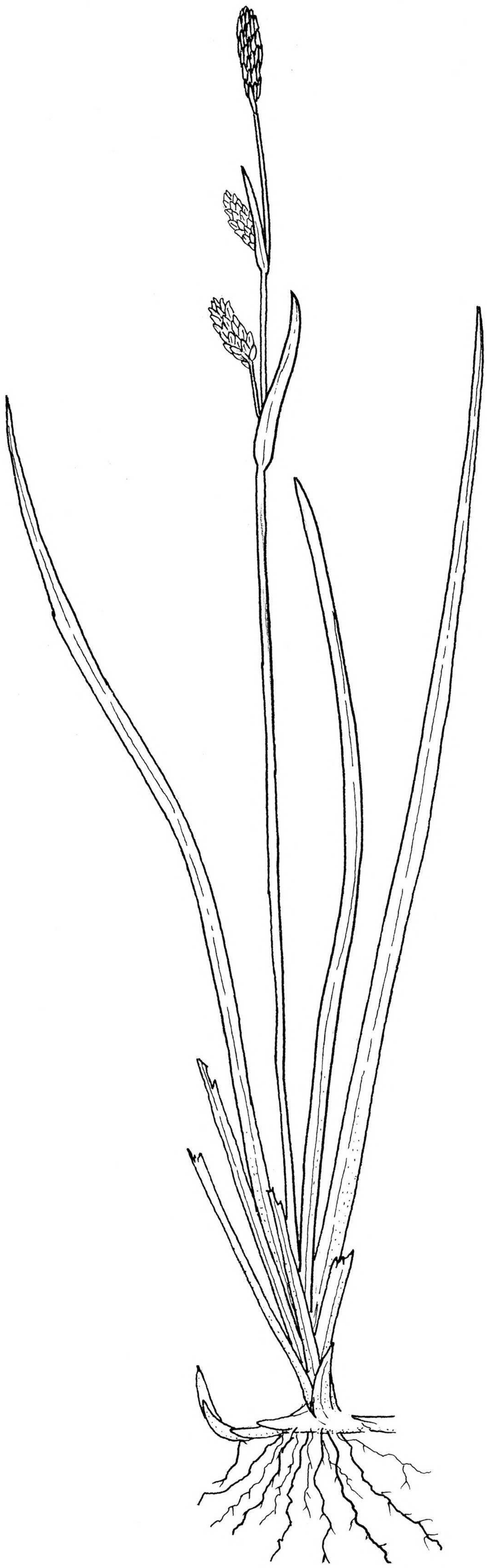

FIG. 2. *Carex klamathensis*, habit.

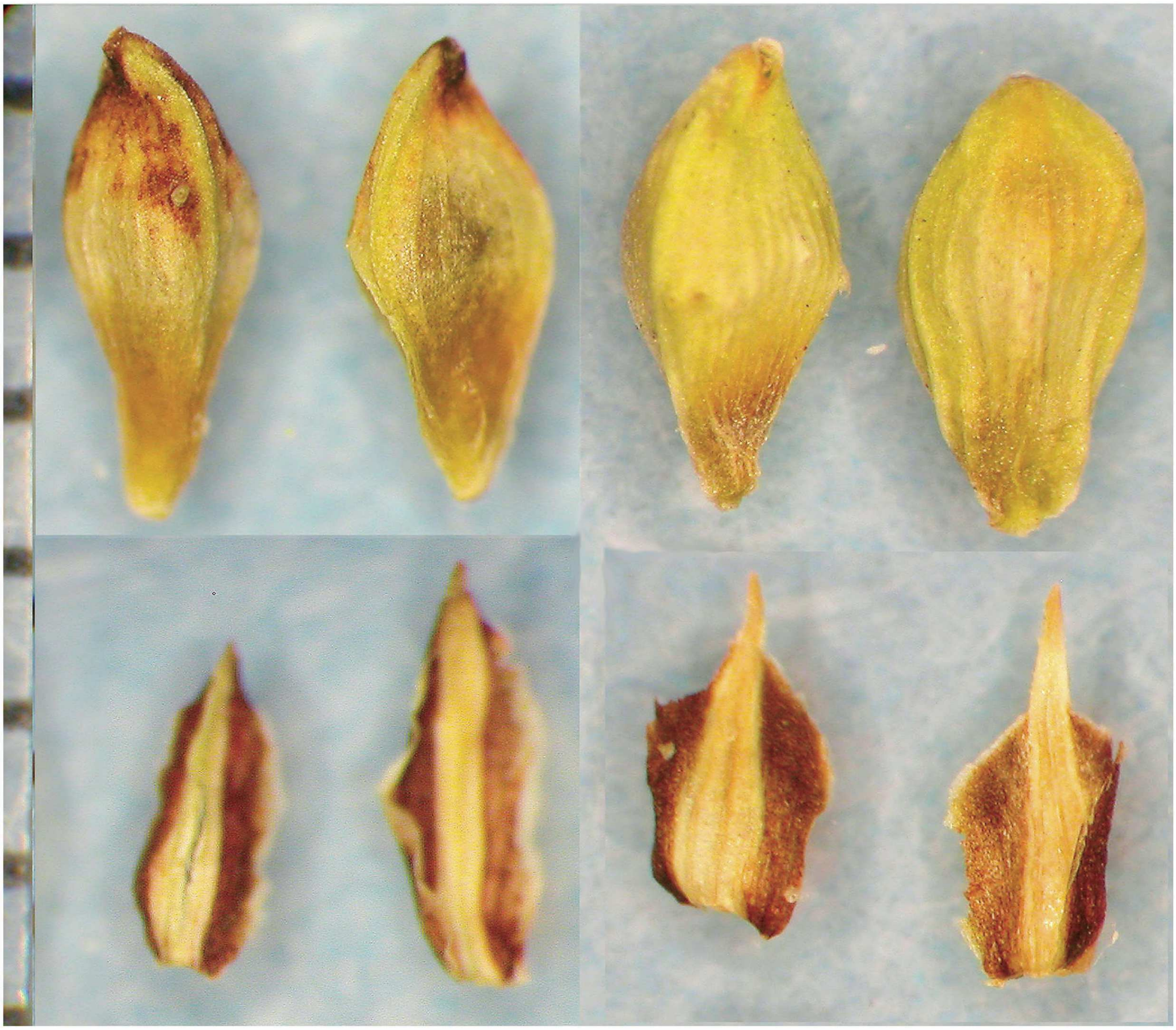

Fig. 3. Perigynia and pistillate scales of *Carex klamathensis*.

Carex klamathensis differs from *C. meadii* and *C. tetanica* of midwestern North America not only in range, but also by its wider leaves and different achene surface. In *C. klamathensis,* the achene surface is reticulate with low ridges and a flat space between the ridges, or with a minute central papilla in that flat space. In the Midwestern taxa, the achene surface is papillate with a large papilla occupying virtually all of the surface between the low ridges. In addition, *C. klamathensis* has smaller perigynia and narrower achenes than *C. meadii,* and lives in a wetter habitat (Table 2; Fig. 4). *Carex klamathensis* has more staminate flowers and therefore a wider staminate spike than *C. tetanica* (Table 2).

Carex klamathensis can be difficult to distinguish from a form of *C. hassei* that lives in serpentine fens in the mountains of northwest California (Table 3). In general, *C. hassei* has two stigmas per pistillate flower and *C. klamathensis* has three, although any three-stigma flowers that abort may have two stigmas. This results in variation in achene shape; two-stigma flowers produce lenticular achenes and three-stigma flowers produce trigonous achenes. In *C. klamathensis,* although most individuals have only 3-stigma flowers, some plants have a few (less than 15%, usually less than 10%) flowers that have two stigmas and produce hard, lenticular achenes. In the *C. hassei* from serpentine fens, few populations have only plants with 2-stigma flowers. In most populations, the proportion of 2-stigma perigynia varies from (33–)40–90%. Two-stigma and three-stigma flowers occur on the same plant, mixed in the same spike, and they are all capable of

Table 1. Traits distinguishing *C. klamathensis* from *C. livida*.

Trait	***Carex klamathensis***	***Carex livida***
Substrate	serpentine	non-serpentine
Leaf width (mm)	wider; average 3.7, (range 1.9–6 mm)	narrower; average 2.2 (range 1.5–3.2)
Terminal staminate spike width (mm)	wider; average 3.5 mm (range 2–5)	narrower; average 2.2 (range 1.4–4.8)
Flowers, terminal staminate spike	average 112 (range 40–190)	average 50 (range 8–71)
Number of lateral spikes 3 or more)	average 2.2 (range 1–4, 40% with	average 1.7 (range 1–3 but only 1% with 3)
Perigynium length (mm)	average 2.9 (range 1.7–3.6)	average 3.8 (range 3.1–4.8)
Perigynium shape some perigynia)	obovate to elliptic (rarely fusiform on	fusiform
Perigynium beak the perigynia)	bent (rarely straight on some of	straight

Table 2. Traits distinguishing *C. klamathensis* from *C. meadii* and *C. tetanica*. Measurements are average and, in parentheses, range.

Trait	***Carex klamathensis***	***Carex meadii***	***Carex tetanica***
Range	Pacific coast states	Midwest	Midwest and east
Substrate	serpentine	not serpentine	not serpentine
Habitat	fens	mesic meadows	wet sites
Leaf width (mm)	3.8(2–6)	2.8(2.4–3.3)	2.5(1.8–3.3)
Terminal spike width (mm)	3.6(2–5)	3.5(2.2–5.7)	2.4(1.8–3.1)
Staminate flowers	112(40–190)	112(48–174)	70(40–120)
Height (cm)	57(30–100)	32(23–47)	26(12–34)
Perigynium length (mm)	2.9(1.7–3.6)	3.6(3.3–4)	2.9(2.4–3.6)
Perigynium width (mm)	1.4(1.2–1.6)	2.0(1.6–2.5)	1.6(1.2–1.9)
Achene surface	reticulate	papillose	papillose

Table 3. Selected statistically significant ($p < 0.05$) traits distinguishing *C. klamathensis* from the form of *C. hassei* that grows in serpentine fens in northwest California. Measurements are average and, in parentheses, range.

Trait	***C. klamathensis*** **Average (range)**	***C. hassei*** **Average (range)**
Culm length (cm)	57(30–100)	33.3(15.2–45.3)
Leaf width (mm)	3.8(2–6)	2.8(1.8–3.7)
Inflorescence length (cm)	14.4(5.1–23.3)	10.0(3.9–17.8)
Inflorescence bract length (cm)	9.1(3.3–14.0)	6.9(3.2–15.2)
Terminal Spike Length (cm)	1.8(1.3–2.7)	1.4(1.1–2.3)
Terminal Spike Width (mm)	3.6(2–5)	2.8(1.4–4.5)
Staminate flowers in terminal spike	112(40–186)	81(57–152)
Lowest staminate scale, length (mm)	4.3(2.2–5.1)	3.2(1.9–5.7)
Perigynia (% with 3 stigmas)	97%(85–100%)	37%(0–62%)
Perigynium length (mm)	2.9(1.9–3.5)	2.5(2.2–2.9)
Perigynium length/width ratio	0.48(0.37–0.58)	0.54(0.46–0.63)
Achene width/length ratio	0.67(0.44–0.88)	0.74(0.48–0.93)

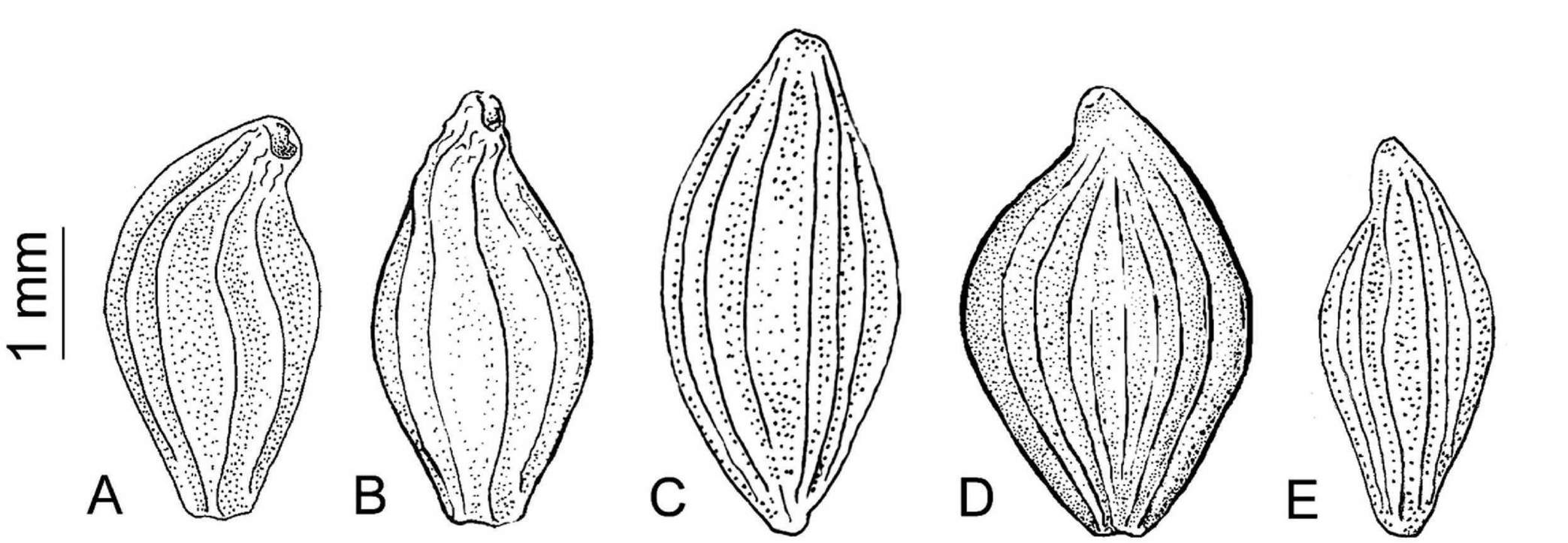

Fig. 4. Perigynia of *C. klamathensis* and similar taxa. A. *Carex hassei*. B. *Carex klamathensis*. C. *Carex livida*. D. *Carex meadii*. E. *Carex tetanica*. Scale at left is 1 mm.

producing hard, dark, apparently viable achenes. In general, *C. klamathensis* is a more robust plant, taller, with longer and wider terminal spikes, longer inflorescence nodes, wider leaves, and slightly longer perigynia. However, populations of delicate *C. hassei* may produce occasional robust plants. (The robust *C. hassei* plants observed were identified as *C. hassei* because they had 50–91% two-stigma flowers.) Because of this variation in *C. hassei*, ranges for most measured traits overlap greatly, even though average dimensions of most traits differ significantly (Table 3). The two taxa also differ in traits such as the color and stiffness of the foliage, which are hard to quantify.

Carex klamathensis is a globally rare species of fens and springs, endemic (Safford et al. 2005) to serpentine substrates. Although 35 specimens were examined (Appendix), these represent only 3 California and 12–15 Oregon populations. Four of the sites (10 collections) were on Eight Dollar Mountain, Josephine County, California, and two more sites were within 3 km south of that mountain.

Populations are probably stable where habitats are stable, but habitats are threatened by road building, recreational use of serpentine wetlands (particularly the effects of off-road vehicles), and mining. These activities can harm *C. klamathensis* populations directly by killing plants or indirectly by altering water flow. The sedge probably survives fire well, both because its rhizomes are protected underground in moist soil and because its microhabitat does not carry intense ground fire well. However, it is vulnerable to those fire suppression activities that involve bulldozers. The three California populations, which are somewhat genetically distinct from the Oregon populations (Wilson et al. in preparation), are all small and isolated. More than half of one has been destroyed in recent years by bulldozing associated with mining. We hope that clarifying *C. klamathensis* taxonomy and morphology will aid in its preservation.

APPENDIX

CAREX KLAMATHENSIS SPECIMENS EXAMINED

[1] = from Day's Gulch, the site of most collections, reported under various names

U.S.A. **CALIFORNIA. Colusa Co.:** Bear Wallow Spring; on N side of Lovelady Ridge about 0.5 mi NE of Pacific Point, T16N R07W S23 S1/2, 5 Jul 1999, *Janeway & Castro 6497* (CHSC); Lovelady Ridge, Bear Wallow Springs, 28 Jun 2002, *Wilson et al. 10702* (OSC). **Lake Co.:** Kanaka Glade, a spring at the head of Spanish Creek East Fork, near the top of Pacific Ridge, T16N R6W S30 SW ¼ of NW ¼, 7 Jul 1999, *Janeway & Isle 6492* (CHSC); Kanaka Glade, a spring at the head of Spanish Creek East Fork, near top of Pacific Ridge, 3 Jul 1998, *Janeway & Castro 5714* (CHSC, OSC); Kanaka Glade, 19 May 1985, *Stebbins C532* (DAV); Kanaka Glade, 28 Jun 2002, *Wilson et al. 10704* (OSC[1]). **Tehama Co.:** Pepperwood Springs, near top of Raglin Ridge, T25N R07W S21 SE ¼ of NW ¼, 11 Jun 2000, *Janeway & Isle 6785* (CHSC, OSC); Pepperwood Springs, 20 Jun 2003, *Wilson & Brainerd 10951* (CAS, DAV, MICH, OSC); Pepperwood Springs, 28 Jun 2002, *Wilson et al. 10708* (OSC, WTU). **OREGON. Josephine Co.:** Frank's Fen, 18

Jun 2000, *Brainerd & Newhouse BLW10403* (OSC, UC); Fiddler Mtn. Road, above Josephine Creek, 1.8 mi S of bridge over Illinois River by Eight Dollar Mtn., 11 May 1974, *Chambers 3958*[1] (OSC+); BLM fen, less than 1 mile down Eight Dollar Mtn. Rod., W of Rte. 199, 23 Mar 1996, *Clery 56* (OSC); West bank of Josephine Creek, about 150 m upstream from ford, 19 Jul 1981, *Greenleaf 1186* (OSC); Whiskey Creek, 17 Jun 1999, *Kuykendall et al. BLW10021* (OSC); Josephine Creek, 25 Jun 1930, Leach 2836 (ORE); TNC Bog/$8 Mtn., 13 Jun 2003, Newhouse & Kuykendall 2003-001 (WTU), 2003-002 (CHSC), 2003-003 (MO), 2003-004 (DAV, OSC); Star Flat, 14 Jun 2003, *Newhouse & Kuykendall 2003-006* (OSC) & 2003-007 (CHSC); Days Gulch Botanical Area, 14 Jun 2003, *Newhouse & Kuykendall 2003-008*[1] (OSC) and 2003-009[1] (NY); Mars Fen/Rough & Ready Creek, 14 Jun 2003, *Newhouse & Kuykendall 2003-010* (OSC), 2003-11 (CHSC, UC, WTU), and 2003-012 (MICH, SOC); south base of Sexton Mountain, 20 May 1948, Peck 24796 (WILLU); Eight Dollar, 18 Jun 1999, *Wilson & Kuykendall 10041* (DAV, RSA, UC); Fiddler Mtn., 18 Jun 1999, *Wilson & Kuykendall 10042*[1] (MICH, WTU) and 10044[1] (OSC, UC); Mike's Gulch, 2 Jul 2003, *Wilson & Kuykendall 10960* (OSC); Siskiyou NF, near fen on Fiddler Mountain, 1.7 mi by road from bridge over the Illinois River, 0.7 mi from Forest Service Road 4201 on a dirt road, 14 May 1994, *Wilson et al. 6782*[1] (OSC); Woodcock Bog, 17 Jun 1999, *Wilson et al. 10013* (CHSC, OSC, WTU); Woodcock Bog, 18 Jun 1999, *Wilson et al. 10053* (OSC); Fens on East side of Eight Dollar Mtn., 18 Jun 2000, *Wilson et al. 10400* (MO, NY) and 10401 (CAS, MICH); Siskiyou National Forest, 19 May 1997, *Zika 13081* (WTU); BLM fen on $8 Mountain Road, 18 May 2004, *Zika 19642* (CHSC, MICH, MO, OSC, UC, WTU).

ACKNOWLEDGMENTS

This project was supported financially by the Bureau of Land Management (Oregon state office, Medford and Salem Districts, and Arcata Field Office), and by the USDA Forest Service (Shasta-Trinity and Siskiyou National Forests). These agencies and the Mendocino, Klamath, and Six Rivers National Forests also provided non-monetary support. We thank the following agency botanists for their assistance: Joan Seevers, Ron Exeter, Mark Mousseaux, Linda Mazzu, and Jennifer Wheeler (all of the BLM) and Julie Kierstead Nelson, Maria Ulloa, David Isle, Susan Stresser, and Lisa Hoover (all of the USDA Forest Service). We thank Dr. Anton Reznicek for advice about the taxonomy of sedges. We thank Richard Halse for use of the combined collections of the Oregon State University herbarium, and for managing loans; Barbara Ertter for loan of specimens from JEPS and UC, Anton Reznicek for loan of specimens from MICH, and James P. Smith and Robin Bencie for loan of specimens from HSC. Kenton Chambers edited the description. The abstract was translated by David Gernandt, Instituto de Biología, Universidad Nacional Autónoma de México and Manuel González Ledesma, Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Hidalgo. Rob Fiegener of the Institute for Applied Ecology made the map. Erin Stangel photographed the perigynia. Rena Schlac drew the illustrations.

REFERENCES

Rothrock, P.E. and A.A. Reznicek. 2002. *Carex* Linnaeus sect. *Paniceae* G. Don in J.C. Loudon. In: Flora of North America Editorial Committee, eds. Flora of North America North of Mexico. Volume 23. Magnoliophyta: Commelinidae (in part): Cyperaceae. Oxford University Press. Pp. 426–431.

Safford, H.D., J.H. Viers, and S.P. Harrison. 2005. Serpentine endemism in the California flora: a database of serpentine affinity. Madroño 52:222–257.

Wilson, B.L., R.E. Brainerd, L. Janeway, K. Kuykendall, D. Lytjen, B. Newhouse, N. Otting, S. Meyers, and P.F. Zika. (in preparation). Taxonomic confusion in *Carex* section *Bicolores* on the Pacific Coast.